

Technology in support of Astrobiology Science

A logging instrument for subsurface planetary exploration

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Mars subsurface exploration is an objective of the coming missions to the red planet in order to study the different layers that are piled up below the surface of any planet, collecting knowledge about geology processes, ancient and recent climate and data about the present and past biosphere.

On Earth, core drilling has been used in petroleum, gas and water market as well as in geological research for many years. Borehole logging is used, from the beginning of last century, to measure geophysics parameters from the wall materials as well as from the surrounding rocks, as a complement to core analysis. In fact, there are many logging tools in the market capable of performing these tasks.

In the frame of the MARTE project (Stoker, 2003) a complete system has been designed to accomplish logging activity during the Mars subsurface simulation campaign, since these techniques have been considered suitable for Mars exploration (Blacic et al. 2000). The Bore Hole Inspection System (BHIS) is built up by two subsystems: a deployment module and logging tools (Borehole Inspection Tool, BHIT). The deployment module will be placed on the “lander” platform and will hold the BHITs during drilling activities. This module will position the BHIT over the hole and will control its movements inside it by means of a special winch. Furthermore, it houses all the electronic and power modules.

As on earth logging, the aim of this system is to identify the geobiologic characteristics of the subsurface. Several techniques have been identified to be implemented, but only a Raman spectrometer, a camera for microscopic images, and resistivity and magnetic susceptibility sensors have been selected. Based on that, both the Raman probe and the camera have been implemented in a special instrument, providing scanning capabilities. Resistivity and magnetic susceptibility will be measured with standard tools.

References:

- C. Stoker et al (2003). *Mars Analog Research and Technology Experiment (MARTE): A simulated Mars drilling mission to search for life on Tinto, Spain*. Lunar and Planetary Science XXXIV
- J. Blacic, et al (2000), *Report on Conceptual Analysis of Drilling Systems for 200-m-Depth Penetration and Sampling of the Martian Subsurface*, Los Alamos National Laboratory LAUR00-4742 (2000)

Acknowledgements

This project is funded by the Ministerio de Ciencia y Tecnología and the Instituto Nacional de Técnica Aeroespacial.